The Recent Status of Secular Variation of Atmospheric Electricity (II)

By

G. KONDO

Abstract

In the previous paper (1958), we described that the atmospheric electricity was changed owing to the radioactive fall-out of the recent nuclear detonations. In this report, the results of the subjects since I. G. Y. 1957-1958 is described.

a : Both of the variations of the potential gradient and conductivity are connected with the variation of the radioactivity of fall-out.

b : The variation of the conduction current is not connected with that of fall-out.

c : It takes about two years to be free from the effect of fall-out on the atmospheric electricity.

§ 1. Introduction

In the first report, 1958 (1), the variations of the atmospheric potential gradient at Kakioka and Memambetsu Observatories were reported that they have been decreasing since about 1954, and in 1958 became about an half of ordinary values. And the origin of such variations were suggested from a few points that these decreasing would be caused by the fall-out of nuclear test explosions. But the data of the conductivity was too scant to think about this. Since the I. G. Y. (July 1957-Dec. 1958) the conductivity has been observed continuously at Kakioka Observatory. Here, the variation of the conductivity is reported, connected with those of the potential gradient, conduction current and the radioactivity of fall-out.

§ 2. The Variation of the potential gradient

Figure 1. shows the variations of the potential gradient at Kakioka and Memambetsu. The values are difference from mean values which were caluculated from the data for 1931-1945 at Kakioka and for 1950-1951 at Memambetsu. And their smoothed values were shown by dotted curves in the figure.

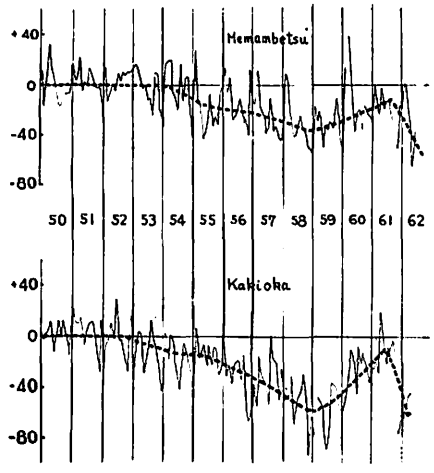

Fig. 1. Secular variations of potential gradient at Kakioka and Memambetsu.

Figure 2. shows the variation of the potential gradient at Kakioka from Jan. 1958 to May 1962 and it's smoothed curve.

It is evident from the figures that the potential gradient was decreased from about 1954 and reached to the minimum in about 1959, but from 1960 it was recovered to the ordinary level. It was decreased again suddenly in October 1961.

§ 3. The variation of the conductivity

Figure 3. shows the variation of the conductivity at Kakioka from Jan. 1958 to May 1962 and it's smoothed curve.

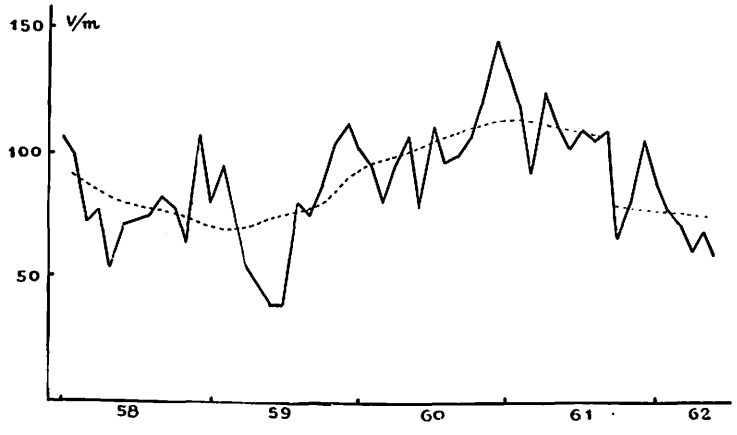

Fig. 2. The variation of potential gradient at Kakioka.

The variation of the conductivity is roughly opposite to that of the potential gradient, and especially the sudden increase in October 1961 is clear.

§ 4. Discussion

Figure 4 shows the variation of the conduction current which is calculated. The potential gradient is measured by water dropping collector and the conductivity

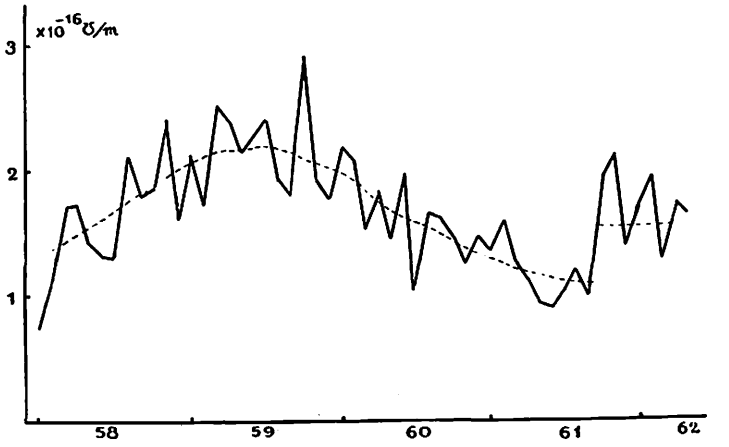

Fig. 3. The variation of conductivity at Kakioka.

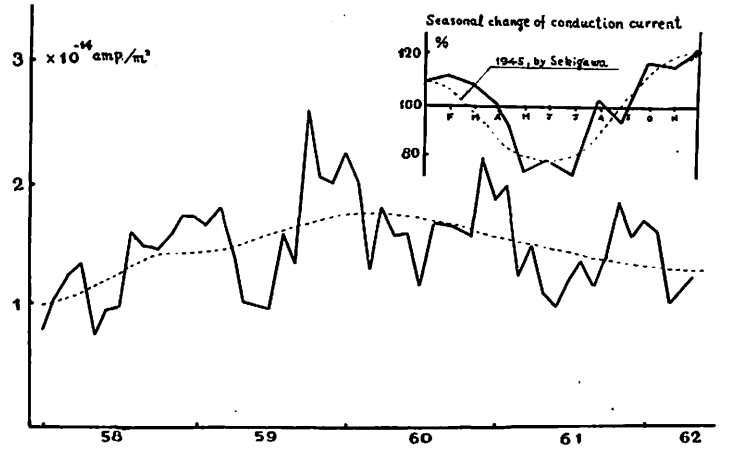

Fig. 4. The variation of conduction current at Kakioka.

is measured by aspiration condenser, so that this calucurated values will include extremely errors. But it may be said from the figure that the variation of conduction current will be explained by the steady smooth change, dotted curve in Fig 4, and the periodical seasonal change shown at the upper part in this figure. To be compared with, the seasonal change of conduction current in 1945 at Kakioka which was calculated by Sekikawa (2) is shown in this figure too. The curves of seasonal change in both periodes are agreed with each other.

Thus, the conduction current seems to be not affected by the fall-out of nuclear test explosions. Figure 5 shows the variation of the radioactivity of large amount of rain and falling dust in easterly Japan.

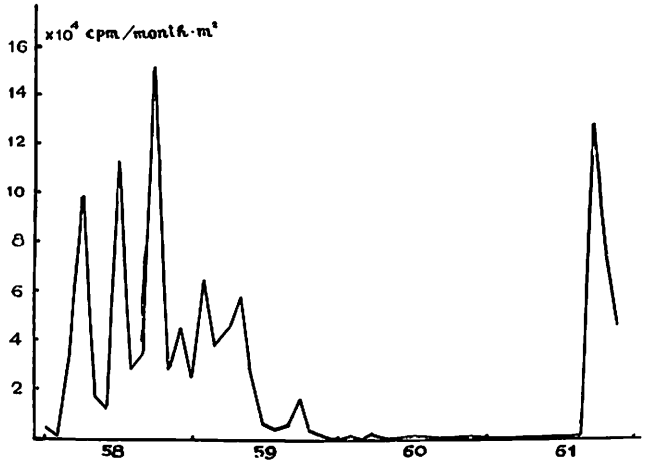

Fig. 5. The variation of radioactivity of large amount rain-water and falling dust in easterly Japan.

The variation of the radioactivity before 1958 is not shown, but fall-out has been observed since about 1954, and from 1960 the fall-out became very small, and it was suddenly increased in October 1961.

§ 5. Conclusion

a) The variations of the potential gradient and conductivity are connected with the variation of the radioactivity of fall-out.

b) The variation of the conduction current is not connected with that of fall-out.

c) From a) and b), it may be most reasonable that the conductivity was increased by the radioactivity of fall-out, while the potential gradient was decreaed.

d) It takes about two years to be free from the effect of fall-out on the atmospheric electricity. The potential gradient and conductivity are recovering from 1960 and reach to the ordinary level in 1961.

These phenomena are not analysed quantitatively here, and to do so, the other elements, say, the ionization by the radioactivity of fall-out and so on, must be observed. It is strongly desired to observe the other elements and to discuss more in detail.

Acknowledgement

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References

1) G. Kondo : The Recent Status of Secular Variations of the Atmospheric Electric Elements and their Relation to the Nuclear Explosions; Memoirs of the Kakioka Magnetic Observatory, Vol. 9, No. 1, p. 2, 1959.
2) T. Sekigawa : On the Diurnal Variation of Air-Earth Current at Kakioka; Memoirs of the Kakioka Magnetic Observatory, Vol. 8, No. 1, p. 75, 1957.

最近の空中電気長期変化 (II)

近　藤　五　郎

概　要

1958年の報告に (1) 於て，近年，核爆発の放射性降下物によって大気電場が変化したことを述べたが，I. G. Y. 以後，電気伝導度の観測が連続して行なわれたので報告する。 a) 大気電場と伝導度は放射性降下物の強度と関連ある変化をしている。 b) 大気伝導電流の変化は放射性降下物の強度変化とは関係がない。c) 放射性降下物の大気電場に及ぼす影響は約２ケ年でなくなると思われる。以上のことが定性的にわかった。